DOCUMENT RESUME

ED 300 537 CE 051 113

TITLE The Case for Computers.
INSTITUTION Business Council for Effective Literacy, New York, NY.
PUB DATE Jul 85
NOTE 4p.
PUB TYPE Journal Articles (080) -- Reports - General (140)
JOURNAL CIT BCEL Newsletter for the Business Community: n1 v4 p4-5 Jul 1985

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Adult Basic Education; *Adult Literacy; Basic Skills; *Computer Assisted Instruction; *Illiteracy; *Literacy Education

ABSTRACT

Given the large gap between the millions of adults in need of basic literacy skills and the shortage of teachers, tutors, and funds to serve them, computer-assisted instruction (CAI) has the potential to reduce the gap. The merits of CAI include its holding power, provision of a positive learning environment, opportunity to learn about computers, enhancement of teacher productivity, instructional effectiveness, and attrition reduction. Notable models embodying many of these elements are the ABLE (Adult Basic Literacy/Education) program and the U.S. Navy's Wisher-Duffy system. Information on the extent of CAI use points to great variation from one literacy-providing sector to another. Elements that impede the wider use of computers to teach adult basic skills include limited access to hardware, lack of good software, prevailing attitudes of educators who resist new techniques, lack of training for educators in the use of CAI, and lack of a central communications network to enable educators to gather information about computers in basic skills and for share experience. (YLB)

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BCEL BUSINESS COUNCIL FOR EFFECTIVE LITERACY

ADULT LITERACY : PROGRAMS • PLANNING • ISSUES

A Newsletter For The Business Community

Vol. 1 No. 4 July 1985

ED300537

THE CASE FOR COMPUTERS

U.S. DEPARTMENT OF EDUCATION
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THE CASE FOR COMPUTERS

As computers come into widespread use in education, from kindergarten to the university, their role in adult basic education demands attention. Given the large gap between the millions of adults in need of basic literacy skills and the shortage of teachers, tutors, and funds to serve them, the potential of computer-assisted instruction (CAI) clearly needs to be explored. Can computers help to reduce the gap? If so, how? To what extent are they currently being used in adult basic skills programs? For what purposes? With what success? If adult basic education were "computerized," could we affect more people more quickly at equal or lower cost?

BCEL thought it timely to begin looking at these questions, especially as scattered reports from literacy providers relate strong positive experiences with the use of computers. To be sure, problems abound in the field, but the initial evidence does suggest that there is a potent, highly significant role for computers in addressing the distinct needs of adult illiterates.

The Merits

Holding Power. Computers are more than just another tool in the repertoire of instructional technologies. For many users they have a compelling fascination—a "holding power" that makes it difficult to put them aside. Teachers report that children compete for access to them, often staying hours after school to use them. Literacy workers tell of elderly women climbing flights of stairs at a center to practice on them. The appeal of computers is increasing student participation and motivating students to stay with instruction.

Positive Learning Environment. For adult non-literates especially, the computer provides a mode of learning that is untarnished by childlike overtones or the failures associated with their traditional school experiences. The most dramatic results have been with people who have been defeated by other methods and who thus believed that they could not read, write, or learn.

Learning About Computers. Adults who learn basic skills on a computer also learn in the process *about* computers. The operational techniques absorbed as a by-product of instruction become in themselves marketable skills. These adults stand a better change of competing for entry-level word processing jobs and job-training programs.

Enhancing Teacher Productivity. Computers can boost teacher productivity in two ways: by improving the ratio of teachers to students and by performing management chores. When students work on computers by themselves, supplementing work given by teachers, teachers are freed to serve more students and to address the students' personal needs and concerns. With the use of computer-managed instruction (CMI), teachers are twice freed: testing, diagnosing, placing students at appropriate levels of instruction, tracking progress, and record-keeping are time-consuming chores efficiently performed by the machines.

Instructional Effectiveness. Another characteristic of the computer is its ability to engender intense concentration. As interactive instruments requiring response by the user, computers produce a high level of task management and they increase attention span. They also provide individualization, self-pacing, and patience. Their capacity to store and retrieve information permits students to interact with material geared to their greatly varied individual levels and rates of speed, and to receive instant feedback. Computers also can repeat the same question endlessly, react without impatience or irritation, and provide the privacy that protects from embarrassment. These features are especially important for illiterate adults. Finally, CAI programs can offer instruction that otherwise would not be feasible. Combined with interactive videodiscs, for example, they can bring reality to the learning situation. Real-life images and sound can be added to the courseware, making it possible to incorporate vivid examples that show how things being learned fit into the daily lives of students.

Reducing Attrition. Drop-out rates often reflect scheduling conflicts due to job and family duties. With computers available for a portion of the program, rigid scheduling can be eased. If a tutor misses a session or a student has extra time, the student can drop by the literacy center and work independently. This flexibility even makes it possible to offer instruction in locations where teachers are not available at all.

Notable Models

A prime example embodying many of these elements is ABLE, the Adult Basic Literacy/Education program of North Carolina's Central Piedmont Community College. ABLE uses a total of 32 microcomputers at four off-campus learning centers. One is in a shopping mall, another in a neighborhood center, and still another in a mobile van serving church and prison populations. Now in its third year, ABLE has served 1,300 persons. The computerized core curriculum in reading and math rests on the PLATO Basic Skills Learning System developed by Control Data Corporation and the University of Illinois. The curriculum is supplemented by Apple software, print and other media, and work with teachers and tutors. For students at the fourth to eighth-grade reading levels, the computer software constitutes 80 percent of the total instructional package. At these levels, the teacher acts as a guide, facilitating the student's progress through the CAI program. At zero to fourth-grade levels, the weight is on one-to-one tutoring, with the CAI component used for about one-third of the program.

The results show a clear advantage over the traditional classroom or tutoring situation. ABLE students advance an entire reading grade-level in 20 hours. In contrast, it takes 150 hours to achieve this in conventional adult basic eduction classes at North Carolina's community colleges. "Beyond the actual time saved," notes Central Piedmont's president, Dr. Richard Hagemayer, "consider what it means in terms of incentive. If you're 35 years old with two children, reading at a fourth-grade level, to put in 150 hours you've got to go to a traditional

Interior: ABLE's mobile classroom

class two nights a week, two hours a night, for 37 weeks. And if you want to qualify for a job training program that requires an eighth-grade reading level, you'd have to go for three years. Compare that with 60 hours."

ABLE administrators credit the success of the achievement rate to the individualization of the program and the intense concentration evoked among students working on the computers.

Another notable model is the U.S. Navy's Wisher-Duffy system, currently being tested at a number of civilian sites, among them the Enoch Pratt Free Library in Baltimore, Maryland, and the Mary H. Weir Library in Weirton, West Virginia. (See News In Brief item, Learning From The Navy.) This system, developed for the navy by cognitive psychologists Robert Wisher and Thomas Duffy, is based on information-processing theories that evolved from research in the 1970's on the nature of the reading process. It improves on presently-available software in significant ways, and has been validated with low-literate naval recruits reading below a sixth-grade level. The recruits improved their reading comprehension in half the time and their vocabulary scores in one-third the time as those conventionally taught, and they retained what they learned about twice as well.

An important pioneering feature of the system is that it enables instructional personnel with no prior knowledge of computers and with a minimum of training to design CAI programs tailored to individual student interests and needs. The "content sensitive" system allows the teacher or tutor to feed the computer any material, in whatever language they please, by simply typing it on the keyboard. In this way the lesson can be tailored to a particular subject of interest to the student—i.e. current events, career or health information, or sports. The lesson can be scaled up or down by using simple or difficult words and shorter or longer sentences. The material is then converted by the computer into a series of exercises which require the student to interact with the step-by-step elements of the reading process.

A major objective of the two library projects is to test the attitudes of librarians and tutors as well as their ability to master the system. After a half dozen orientation sessions totaling 15 hours, library staffs and volunteer tutors, all new to computers, were able to produce their own specifically-targeted programs. The subjects include money management,

vocational information, income taxes, driver education, and consumer affairs. Extensive evaluations and further development are being conducted by Dr. Duffy at Carnegie Mellon University.

Extent Of CAI Use

The extent to which CAI has penetrated the adult basic education community is unknown. No data have been systematically collected and there is no central communications network. Fragments of information point to great variation from one literacy-providing sector to another. These range from the virtually non-existent use of technology among the voluntary providers to a very limited use by corrections, job training, and state ABE programs, to the military at the top. Some random examples follow:

• In 1980, more than $70 million was spent by the military for basic skills education and training, with a significant portion for CAI. According to 1984 Department of Defense figures, one-third of all new recruits read at or below the eighth-grade level. These enlistees have to digest information that will enable them to operate and maintain sophisticated, costly, and dangerous equipment. It is no surprise, then, that the military is the most advanced in software and systems development.

• In the correctional system, a 1981 Ford Foundation study found that computer-related learning experiences were available to some 40 of the nation's 600 federal and state prisons. The number is thought to have grown substantially since then. To gather solid data, the Correctional Education Association is about to launch a $200,000 survey of the nation's prisons to determine the extent and nature of computer instructional uses. In addition, between 1984 and 1985, some $1 million in grants to 15 states will have been made by the National Institute of Corrections to enhance or develop such programs.

• In St. Paul, Minnesota, a $1.3 million community CAI program was opened in a walk-in storefront earlier this year. Called TLC for Technology Literacy Center, the program is funded by a consortium of foundations and the St. Paul Public Schools. Among its goals are to train educators and to conduct research on applying the technology to basic literacy instruction.

• Under Section 310 of the Adult Education Act, states are required to spend at least 10 percent of their federal ABE funds for innovative efforts. A review of these activities reveals that in 1984 and 1985, only 17 and 23 states respectively sponsored computer-related basic skills projects. CAI projects made up less than 15 percent of all pilot programs funded. The 1983 and 1984 expenditures for such CAI efforts was less than $250,000 a year. This sum increased in 1985 to over $650,000, and brought with it a shift in emphasis from computer-assisted to computer-managed instruction. Fortunately, these negligible ABE figures do not reveal the entire story. A few states have moved toward more extensive CAI for adult basic skills. Massachusetts, for example, has a statewide plan to introduce computers into its ABE program, and more than half of ABE's learning centers already have them. Other more advanced states are Florida, New York, and the four-state Northwest Consortium of Oregon, Washington, Idaho, and Alaska. In California, Illinois, and Michigan computer technology is part of the adult basic education scene but the prevailing use has been for instructional management.

With so few overall facts available on the state of the art, BCEL consulted experts in the field and asked them to estimate the total extent of CAI usage for basic skills instruction among all literacy providers in the nation. On a scale of one to ten, not a single response exceeded two.

Issues For The Future

What elements impede the wider use of computers to teach adult basic skills?

Hardware. Access to hardware is not the serious barrier that might be supposed. Microcomputers are quickly becoming commonplace in American society. Their growth in the public schools has been explosive, doubling annually since 1981. Of 700 school administrators recently surveyed, 94 percent reported that their students had access to school computers. (Apple had a commanding lead as of 1983 with 49 percent of the school market; Radio Shack at 21 percent and Commodore at 15 percent were the next most popular.) Hardware prices have fallen dramatically. A microcomputer and printer can be bought today for $700 to $1,000 and the median price for a program is presently around $43. Manufacturers, vying for superior position, have donated thousands of machines to school districts, with a market value in the millions of dollars. Some observers believe the razor/razor-blade principle may soon apply: manufacturers may give the machines away in order to sell the software.

This does not mean that access is universal. Many populations are still deprived of the opportunity to use computers, especially disadvantaged groups. But this problem can be overcome if there is a will to do so. The Houston Independent School District, for example, runs a program called "Computers Can," which lends for home use 4,500 school computers and then trains parents in their use. The target populations are economically disadvantaged. Another Houston project, "Compu-Buy," lets parents buy the machines at district-negotiated bulk prices and provides a lending library of educational software. The district also cooperates with the local college ABE program, providing adults with nighttime access to its computers. In another example, the Boston Computer Access Council—comprised of representatives from business, education, ABE, job training, and the handicapped—meets monthly to explore ways to facilitate access to the thousands of computers in the city for disadvantaged citizens. The Houston and Boston approaches can easily be adapted elsewhere. And libraries and community organizations have by their nature a capacity to make both computers and computer services available to neighborhood residents.

Software. Far more difficult is the problem of quality software. It is a well known axiom that computers are only as good as the programs that feed them. According to EPIE, the Columbia University Educational Products Information Exchange (which evaluates computer programs for the schools), 60 percent of educational software "is not worth the money." (It is estimated that $20 million was spent by the schools in 1983 for software, with another $110 million spent on educational software for the home.) Most of the material fails to exploit the computer's capacity to develop problem-solving and independent reasoning skills in the user. Drill and practice programs, for instance, make up half the inventory, and tutorials another quarter. These serve a useful purpose for adults learning basic skills, but they do little to foster independence of thought. Simulations and the higher order problem-solving programs represent less than a fifth of the inventory.

More to the point, there are virtually no programs available that have been designed specifically for adult basic education students. PLATO's is the only comprehensive basic skills cirriculum designed for adults, yet even it is not geared to mature persons and their daily lives. The content was designed chiefly for 16-21 year olds and most adult students are much older. The average age of students in the ABLE program is 36. Moreover, a third-grade reading level is required to use PLATO at all, and many adults have a lower level of achievement.

Throughout the field the critical need for appropriate software is stressed over and over again. But program development is extremely costly, and software publishers are either uninformed about the size of the adult basic education market or not willing to risk the investment.

It should be noted that Senator Albert Gore has introduced into Congress a bill calling for establishment of a $150 million revolving fund to support venture capital organizations in developing educational software. It is to be hoped that where the focus is on adult basic skills, researchers, literacy providers, and the software developers will come together to plan needed curricula.

Other Barriers. The other main elements that impede forward movement have to do with prevailing attitudes among educators, lack of training, and poor patterns of communication. Educators are historically resistant to adopting new techniques, and the idea of computers for adult basic skills is not yet sufficiently included in their thinking. Beyond that, professionals need training to be able to work with computers and feel comfortable with them, to evaluate and select software, and to articulate computers with the rest of their instructional program. And volunteers, too, must be involved in these activities. Furthermore, the lack of a central communications network for gathering information about computers in basic skills and for sharing experience leaves practitioners isolated and without support for improving current programs or developing new ones.

The problem of adult illiteracy is too massive to be solvable in traditional ways alone. Most experts agree that to sharply increase the numbers of adults being instructed, as well as to achieve economies of scale in the long run, the use of computers and other technology will be vital. Thus it behooves those interested in advancing adult literacy in the U.S. to investigate further and seek avenues for promoting the greater use of computers. And it should be kept in mind that as computers become more commonly used in adult basic education a goal should be to assure that persons most in need of educational help have access to them. Otherwise, the gap between the "knows" and "know-nots" will be enlarged.

As a next step in exploring some of the issues only touched on in this article, an invitational conference is now being planned that will bring together literacy practitioners in the U.S. who have experience using computers in their programs. The conference, tentatively scheduled for the fall, will be sponsored by the Gannett Foundation with the participation of BCEL, B. Dalton Bookseller, and others. BCEL itself is planning a full-length monograph on computers and adult basic skills to be available by the end of the year.